

Echocardiography in Fever Investigation in Patient with Long Term Central Venous Catheter

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Introduction

Long-term central venous catheters are used in cases where there is a need for long-term or definite vascular access, such as chemotherapy, dialysis and long-term parenteral nutrition.

These can present several complications related to implant, handling or maintenance. Because they are invasive and frequently handled, they may induce local thrombosis and, when settled, they can cause infections, becoming vegetations. The infection related to these devices is a complication of major morbidity and mortality and remains a challenge in clinical practice¹.

Since Transthoracic Echocardiography (TTE) is a method of easy access, noninvasive, inexpensive and readily available, it has become the imaging test most often used as an initial means to evaluate not only cardiovascular diseases, but also to investigate complications related to the presence of catheters. However, these complications are not always visible on TTE, often requiring diagnostic complementation with Transesophageal Echocardiography (TEE)².

This case reports diagnostic investigation of long-term fever in patients with chronic kidney disease and long-term central venous catheter for hemodialysis, who underwent kidney transplantation, enhancing the value of TTE associated with TEE.

Case Report

Female patient aged 24 with history of chronic kidney disease, papillary carcinoma in the right kidney and bilateral nephrectomy on hemodialysis for two years through Permcath catheter in the right internal jugular vein. The patient underwent renal transplantation from a living donor and developed fever on the third day after the surgery, with no apparent focus, even in prophylactic use of first-generation cephalosporin.

Keywords

Echocardiography, Transesophageal; Central Venous Catheters; Fever; Catheters, Indwelling; Renal Insufficiency, Chronic; Renal Dialysis.

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At first, blood cultures were taken and TTE was asked. Blood cultures were negative and the TTE revealed a fixed echodense mass on the right atrial wall, which may correspond to thrombus or vegetation (Figure 1).

For diagnostic reasons, the patient underwent TEE for a better evaluation, which confirmed the presence of echodense cotton-like mobile mass in the right atrial wall emerging from the superior vena cava, measuring 3.4 x 0.9 cm approximately. Another image attached to the right atrial wall close to the tricuspid valve ring measuring 1.4 x 1.4 cm (Figure 2) was also found. Then the central venous catheter was removed and sent for culture, which showed growth of *Enterobacter sp.* Antibiotic therapy with piperacillin and tazobactam was administered for seven days, and ciprofloxacin for six weeks.

The patient was asymptomatic during antibiotic therapy and underwent new control with TEE at the end of the sixth week of treatment, which showed persistence of pedunculated mass measuring approximately 4.5 x 1.3 cm, attached to the superior vena cava, with great mobility within the right atrium, to the point of projecting to the tricuspid valve, in addition to another mass attached to the right atrial wall (Figures 3, 4 and 5). The patient did not use any anticoagulants during treatment.

As the mass increased in spite of antibiotic therapy, surgery was chosen for removal. Thoracotomy was performed with cardiopulmonary bypass, in which the venas cavas were dissected and the right atrium was opened, evidencing a mass of approximately 5 x 3 cm, originating from the superior vena cava, clearly related to the presence of prior catheter. The dissected mass was sent for histopathological examination, culture and antibiogram.

The other mass, sessile, was close to the inferior vena cava, measuring approximately 2 x 1 cm, intimately attached to the right atrial wall and compromising the tricuspid valve. The whole mass was dissected, along with the right atrial wall, involving the tricuspid valve ring. Valve repair and reconstruction of the right atrium with autologous pericardium was successful performed.

Pathological examination of both masses showed mural thrombosis with white platelet-fibrinogen thrombus standard under organization, absence of atypias or signs of neoplasia. Culture of the surgical specimen was negative.

Discussion

Today, there are more than 45,000 patients with chronic kidney disease on dialysis in Brazil, which further increases the risk of complications in these patients³. The use of long-term venous catheter has been progressively increasing in relation to arteriovenous fistula for hemodialysis,

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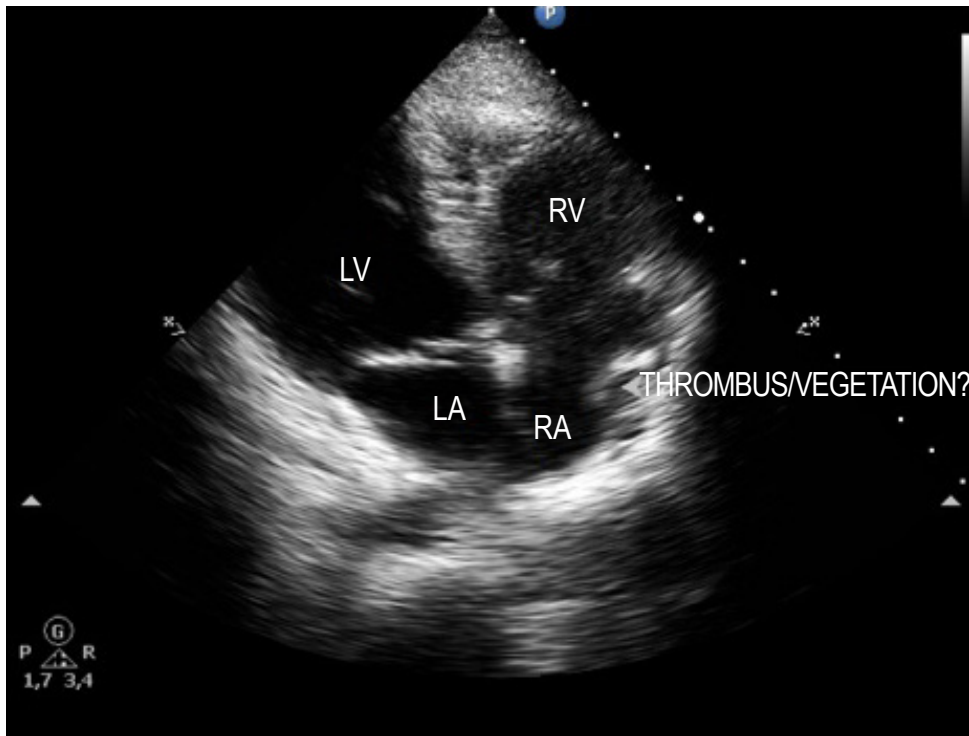


Figure 1 – Apical four-chamber view on TTE demonstrating mass adhered to the Right Atrial (RA) wall. LV: left ventricle; RV: left ventricle; LA: left atrium.

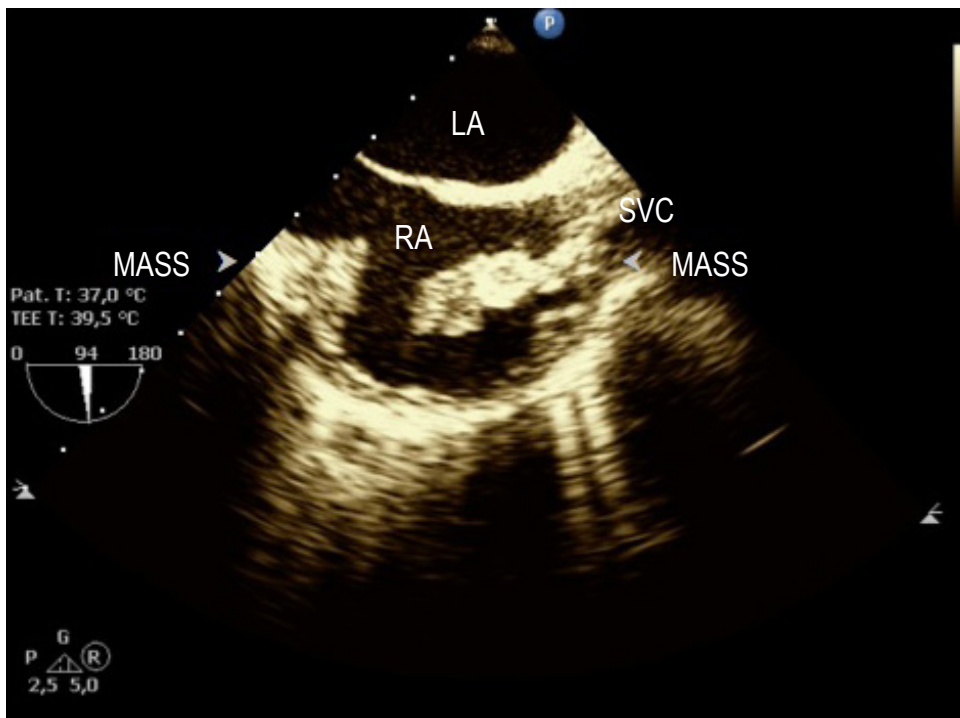


Figure 2 – Bicaval image on TEE revealing a large pedunculated mass within the Right Atrium (RA) emerging from the Superior Vena Cava (SVC). In the lower portion of the RA, additional sessile mass can be observed at that level. LA: left atrium.

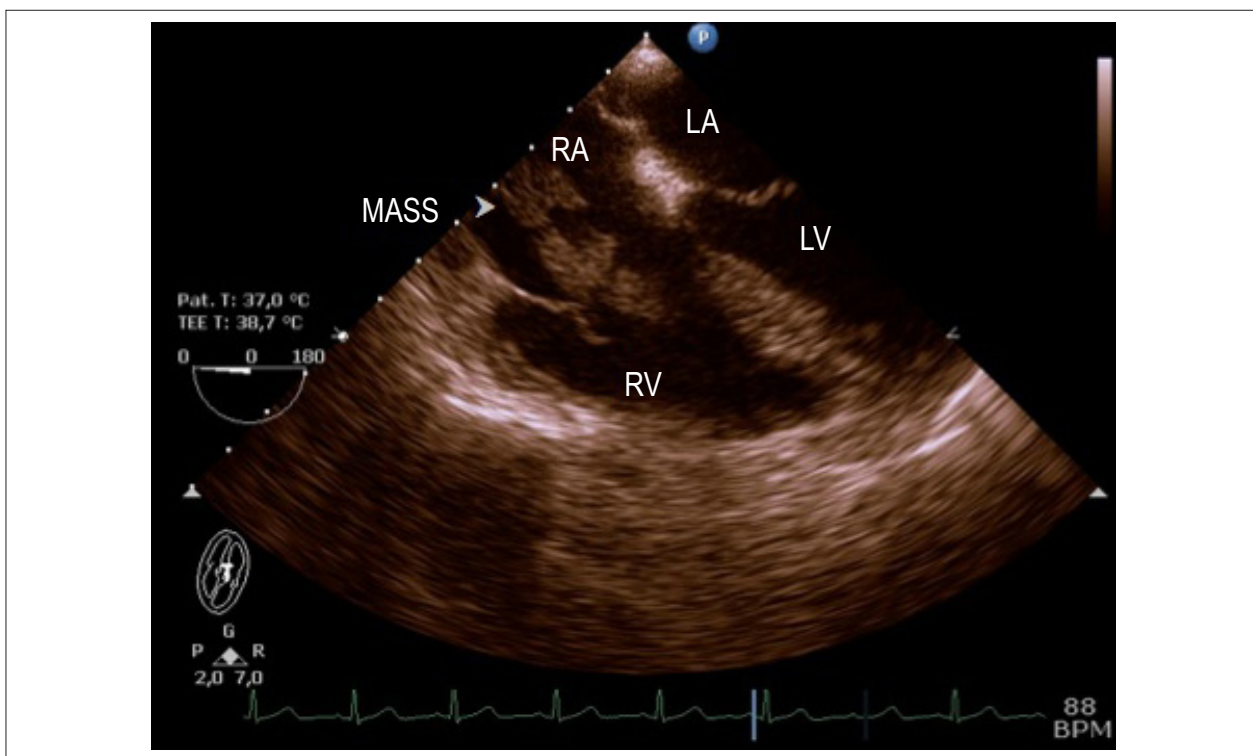


Figure 3 – TEE (four-chamber view) after antibiotic therapy and removal of the central venous catheter, observing persistence of large mass. LA: left atrium; RA: right atrium; LV: left ventricle; RV: right ventricle.

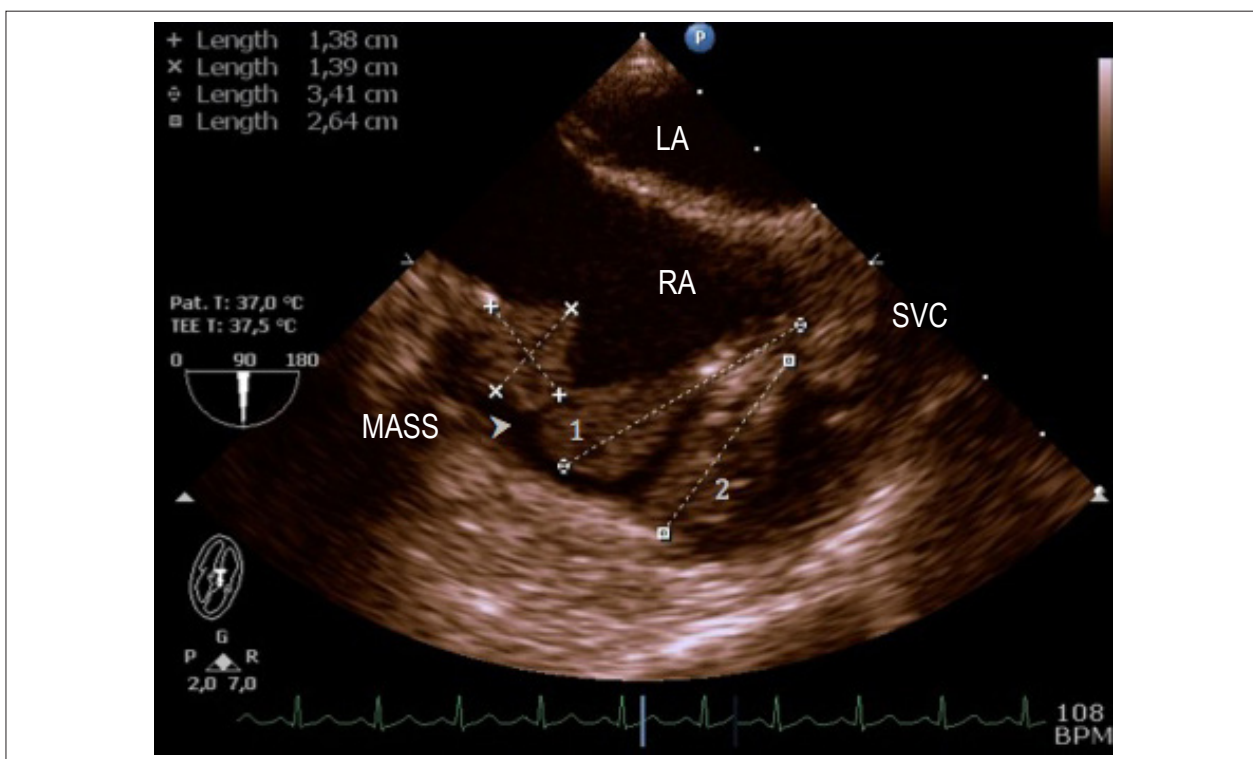


Figure 4 – TEE (bicaval view) after antibiotic therapy and removal of the central venous catheter, demonstrating increased pedunculated mass and persistence of fixed mass in the Right Atrium (RA). The image reveals two components which protrude into the cavity measuring 3.4 cm (1) and 2.6 cm (2), respectively. LA: left atrium; SVC: superior vena cava.

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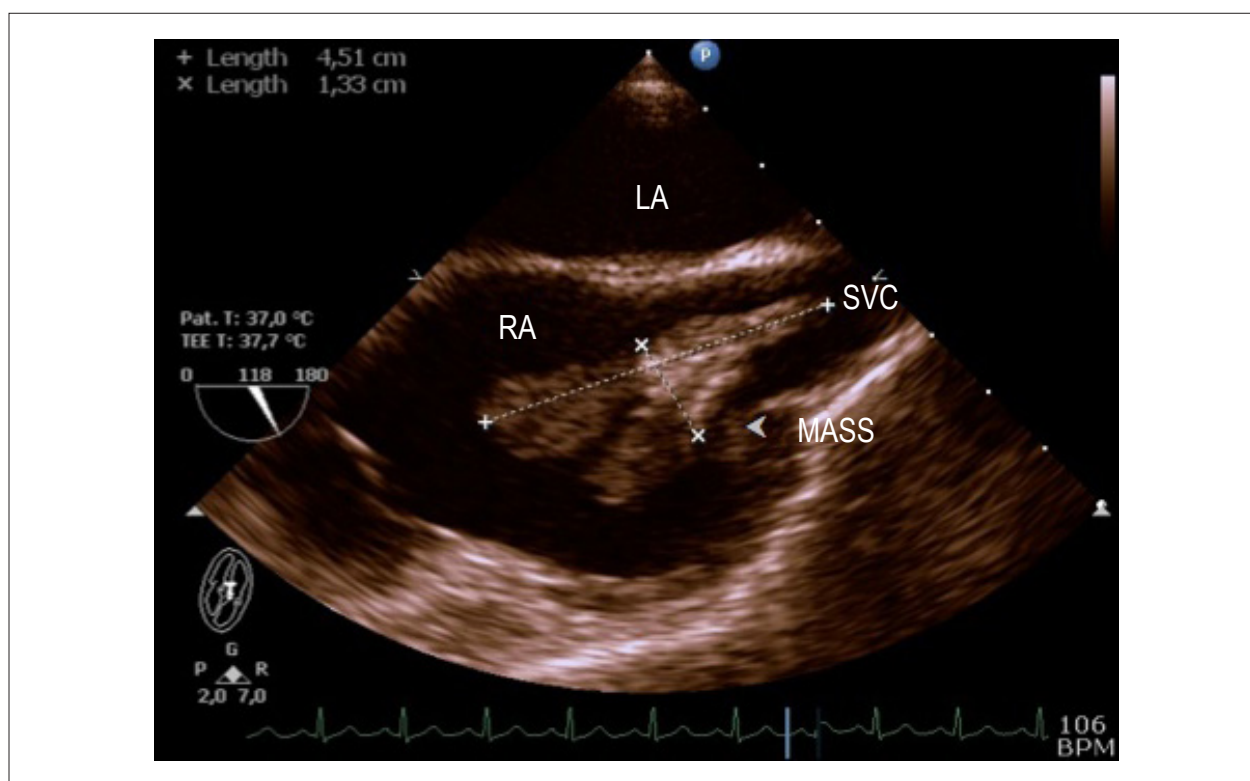


Figure 5 – TEE (longitudinal view) after antibiotic therapy and removal of the central venous catheter, detailing the origin of large pedunculated mass from the superior vena cava (SVC), measuring 4.5 cm in its greatest diameter. LA: left atrium; RA: right atrium.

achieving usage rates higher than 25%, with the advantage of immediate use after deployment. In contrast, these patients are at higher risk of infection⁴.

In some patients with central venous catheter, thrombus or vegetations may go unnoticed due to previous antibiotic therapy, masking symptoms or TTE inability to detect masses at the level of the superior vena cava, if any, among other factors.

Echocardiography, either TTE or TEE, has a fundamental role in the diagnosis, prognosis and monitoring of patients with infective endocarditis or evidence of thromboembolic phenomena, such as patients with central catheters, and it is thus considered the method of choice for identification of intracardiac vegetations or masses^{5,6}.

The TTE is a rapid, non-invasive, inexpensive method with good specificity to identify vegetation, but its sensitivity ranges from 65% to 80%. In patients considered at low risk for infective endocarditis, good quality transthoracic examination is sufficient to rule out the diagnosis. On the other hand, those in whom clinical suspicion persists, despite negative transthoracic examination, transesophageal study should be performed^{7,8}.

TEE is a safe method with very low rates of complications. It has a higher diagnostic accuracy than TTE, with excellent sensitivity for detecting vegetations (82% to 94%) and specificity of nearly 100%.⁹ It produces images of higher resolution and better definition due to its greater proximity

to the cardiac structures and because it does not suffer interposition of the chest wall and uses transducers with higher frequency. When the initial TEE is negative but suspicion of endocarditis remains, repetition of transesophageal examination within seven to ten days may be recommended^{10,11}.

Although right-side vegetations can be better seen on TTE, TEE is still the most sensitive method for diagnosing lesions in patients with catheters or pacemakers¹², and is of the essence when the thrombus or vegetation is in the superior vena cava, inaccessible to surface examination.

The presence of a central catheter deployed deeply within the right atrial cavity, such as in this case, can cause microtraumas to the endocardial valves and cavities, stimulating coagulation cascade and triggering the deposit of thrombi elements¹³, which may eventually be colonized, turning into infectious endocardial vegetations. Vegetations on the right side of the heart usually tend to be larger than those on the left. They often exceed 20 mm due to an association of large deposits of thrombi and fibrin, due to the low-pressure system¹⁴. This fact justifies the large proportions that the vegetations reach, such as in this case. Furthermore, potential coagulation disorders associated with immunosuppressant effects may have contributed, in this case, to the persistence and even to the increase of the mass in the right atrium. Absence of laboratory evidence confirming the colonization of large masses, during antibiotic treatment, cannot rule out

the possibility of secondary infection in these large atrial thrombi^{15,16}, as in our case.

It is important to note that the complete distinction between thrombus and vegetation cannot be seen on echocardiography alone. It is necessary to correlate the echocardiographic findings with the patient's clinical and laboratory data.

In conclusion, long-term central venous catheters may be the cause of thrombosis or mural endocarditis originating from the superior vena cava, with potential extension to the right atrium. In this situation, TTE, and mainly TEE, are of the essence for the diagnosis.

Authors' contribution

Research creation and design: Travessa AF; Data acquisition: Travessa AF, Ferreira RL; Data analysis and interpretation: Travessa AF, Ferreira RL; Manuscript drafting:

Travessa AF; Critical revision of the manuscript as for important intellectual content: Campos Filho O; TEE on the patient: Travessa AF, Ferreira RL, Suguiuti CR; In-hospital patient monitoring: Souza MR, Fernandes RWA; Cardiac surgery on the patient: Branco JNR, Vargas GF.

Potential Conflicts of Interest

No relevant potential conflicts of interest.

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Academic Association

This study is not associated with any graduate programs.

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